# QUESTIONS AND ANSWERS On An Important SUBJECT

# The Care of WOODWORK


At Dedham, Mass. Built of Wood
and still standing.

# WOOD

*Nothing Equals It for Beauty .. Workability and Lasting Satisfaction*

**For centuries, wood has been the preferred material for home building. It is today the best known, most widely used, and most satisfactory material for home construction. Yet, no two pieces of wood are exactly alike. Wood will never behave like cold stone or metal. Articles made of wood still possess its variable characteristics. It is the irregularity of wood grain that gives it beauty.**

**The proper care of woodwork is of interest to most people. Many of us, at some time or other, have questioned the performance of wood — why does it do this, or why won't it do that? Many of the more common questions are covered in this book.**

**As manufacturers of fine woodwork since 1866, we believe we are qualified by experience to discuss this very important subject. Yet, it is entirely possible that some of the answers here may lead to discussions and, possibly, to more questioning. To the best of our knowledge the information given here is accurate and dependable.**

**We feel sure that once you are familiar with the contents of this book, you will be able to understand some of the problems pertaining to the care of woodwork.**

**Curtis Companies Incorporated**

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# WOOD TREATMENT

*Q. What Causes Wood to Decay?*

A. Wood decay is the result of attack by a miscropic plant which grows upon wood and depends on it for food. Favorable growing conditions are required. The temperature must be about 60°F. or higher, and the moisture content of the wood must be around 20% or more. Wood permanently under water, however, and away from air will not decay. When dry, rotten wood is discovered the damage has been done previously when the wood was warm and moist. There are several species of rot fungi. All behave differently but they generally produce about the same results. Some thrive more than others. Relatively few species actually attack woodwork in buildings.

*Q. Can Wood Decay Be Prevented?*

A. Yes. Wood properly used in building construction is as permanent as any other material. Thousands of century-old wood structures are still in use today. Proper design of woodwork, judgement in its use, and protection against its enemies are essential. Relatively few parts of a house are subject to decay. Parts so exposed can now be economically treated to prevent fungus attack.

For years, railroad ties, bridge timbers, piling and poles have been treated to last until they actually wear out. In a home, few parts need such treatment. Shingles, wall coverings, floor, window frames sash and doors can now be had in treated form with an assured long life. Proper protection from seepage and exposure will prevent decay of possibly 90% of the wood parts of a home. The remaining parts may be protected adequately by mould proof paints and by use of preservative treated frames, windows, shutters, doors, etc. In this field, CURTIS pioneered the way in offering the builder woodwork that is decay resistant.

*Q. How Effective Is Treatment of Wood Against Decay?*

A. Complete 100% treatment of wood is difficult and expensive. It is seldom necessary. Railroad ties, poles, timbers, etc., can be treated to last a generation under the worst possible conditions.

In homes and buildings, such complete treatment is not warranted. Many of the treatments used for ties, poles, etc., are not suitable for homes because of odor or because of lack of paintability.

In house construction, a reasonable penetration of preservative along the sides and in the ends of wood members is sufficient. Most parts of a house are never subjected to sufficient moisture to support decay. If properly designed and built only a few exposed parts really need treating. Such parts should be fitted before treating so that there may be no cutting and exposure of unprotected surfaces. If this procedure is followed there should be no occasion for decay in products moderately but effectively treated.

*Q. Is CURTIS Preservative Treatment Termite Proof?*

A. While extensive laboratory tests have not been run, tests made in infested areas have shown that the toxic ingredients in CURTIS preservative treatment offer a high resistance to termite infestation. This is further verified by the fact that no complaint of termite damage have ever been registered against CURTIS preservative treated wood, since 1932 when the treatment was adopted.

*Q. Does CURTIS Preservative Treatment Render Wood Water-repellent?*

A. Yes. The most highly effective water-repellent agent available is used in the CURTIS preservative treatment. As their name implies, however, water-repellents only repel; they do not completely prevent moisture absorption or loss. Water dropped on the surface of CURTIS treated products stands in globules until it dries, it does not wet or penetrate the surface like it does on the untreated wood.

Windows treated with the CURTIS water-repellent, painted and exposed on a roof fully assembled, have shown only very small increases and decreases in moisture content due to the weather. Untreated windows in the same test experienced variations over a wide range.

# MOISTURE CONTENT OF WOOD

*Q. Under What Conditions May Woodwork Safely Be Delivered to a Job?*

A. Woodwork to be warehoused properly, should be under as nearly identical conditions as will prevail in the building in which it will be installed. Everyone knows that a new building will be more damp during construction than after it has become "seasoned." Woodwork should not be delivered to a building until it has been properly conditioned to receive it. Positively keep it off the premises during, and for some time after plastering. Never store it in a basement. Likewise it should not be delivered during wet weather unless completely protected. Some dealers wisely refuse to deliver woodwork until the house is tested after being closed overnight, and relative humidity has been reduced to a safe value—at least 50% in summer and 35% in winter.

*Q. Should Plaster Be Dry Before Trim and Doors Are Installed?*

A. Absolutely. Is there any reason except haste and carelessness for doing it any other way?

Trim and doors fitted in a wet building will show open joints when the house and woodwork dry out. There may

also be trouble with raised grain caused by excessive dampness. Another danger, especially in cold weather, is that the water given off by the wet plaster will condense on outside doors and on windows, and cause irreparable damage to doors and sash before they get their protective coatings of paint or varnish. No manufacturer or dealer in woodwork should be blamed for trouble which will follow installation of woodwork in buildings with wet plaster.

*Q. Why Should Only Seasoned Lumber Be Used for Joists, Studs, etc.?*

A. Unseasoned or wet lumber is sure to shrink when it dries out to normal moisture content. It is very desirable to use only dry lumber, but what can be done about lumber that gets wet from rain during construction? This is really a serious problem that deserves more attention. It might be well to examine your building plans to see the places where the drying out of framing members may cause shrinking and cracking of plaster. In all wood construction the parts may all shrink together without much distress, but in brick or stone veneer construction the shrinking of joists, with studs set on top of them, may cause a lot of stresses in door and window sills that rest on the masonry, unless soft calking for take-up is allowed. Drying out of studding is the main cause of plaster cracks in the corners of rooms. Drying of joists may pull the floor away from the baseboard and even allow the building to settle enough to crack plaster. Finished flooring should, if possible, be well dried before laying. Attention to use of dry lumber as well as details of construction is well worth while.

*Q. To What Moisture Content Should Woodwork Be Dried?*

A. Woodwork should be dried to a moisture content which corresponds to the average atmospheric moisture content of the locality where it is installed. Temperatures and humidities vary greatly throughout the U. S. In this case we are confining our discussion to interior woodwork, which is entirely protected from direct rain and moisture.

In localities where home heating is required we are apt to encounter a large variety of conditions during the winter. Often homes are heated with air conditions that may dry the woodwork to as low as 4% or 5% moisture content. Again, enough moisture may be added to cause condensation troubles at the windows. (This usually occurs before the woodwork shows distress.) The highest moisture content of woodwork generally occurs during prolonged damp weather in summer. This may reach 13% to 15% but rarely any higher. An average moisture content for woodwork for most of the U. S. would run between 8% to 11%. For localities of extreme conditions the woodwork should be "tempered' for a few weeks before installation, for best results. The smaller the seasonal range of moisture content variation can be kept the better it will be for the woodwork.

*Q. Can Manufacturer of Woodwork Control Moisture Content?*

A. Yes as long as woodwork does not leave his premises a manufacturer may control the moisture content within reasonable limits.

But, as soon as it leaves his care and supervision his best wishes cannot prevail over what may happen.

Wood will always try to contain an amount of moisture corresponding to the moisture in the air surrounding it. If the manufacturer could guarantee that his woodwork would not be rained on, if he could send a permanent supply of properly humidified air along with it, if he could be sure when it is unpacked that it is not installed in a wet house, and if he could control and operate the heating or air conditioning plant in the home, then he could really begin to do a job of moisture control in woodwork. Until then, he must have the cooperation of everyone all along the line.

*Q. Can Moisture Content of Woodwork Be Determined on Job?*

A. It can be guessed at with about as much accuracy as predicting the weather. An experienced workman can tell whether it is "wet" or "dry." It can be sensed to some extent by the way it works or feels, or by its weight, but none of these methods indicate "how much."

If woodwork has been continuously and completely exposed to air at a fairly constant and known humidity for a few weeks, the moisture content may be estimated with a fair degree of accuracy. The following relative humidities will produce in wood the corresponding moisture contents when the temperature is around 70°:

| | RELATIVE HUMIDITY | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| % | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 |
| | MOISTURE CONTENT | | | | | | | | | | | | | |
| % | 3.1 | 3.8 | 4.5 | 5.3 | 6.1 | 6.9 | 7.7 | 8.5 | 9.3 | 10.2 | 11.2 | 12.3 | 13.5 | 15.2 |

To determine accurately the moisture content of any piece of wood, a representative sample must be cut, weighed, dried bone dry, and weighed again. The % of weight lost, based on dry weight, is the moisture content. Obviously this is impractical for installed woodwork. It is unsafe to rely too much on scraps lying around the room for use as samples. They may not represent the main item at all. Also remember that the humidity at the time of inspection may not be the same as it was a few days before.

Moisture meters which depend on the electric conductivity of wet or dry wood may or may not be reasonably accurate. Much depends on how they are used.

*Q. Why Is It Advisable to Leave Closet Doors Open for a Time After House Is Finished?*

A. This question is only one of many that suggest the general need of airing out every part of any newly built house. Comparatively few houses are ever constructed without being rained on during the process. Lumber used

in building is generally not completely dry. Then also barrels of water are put into the structure with the masonry and plaster. A new house is extremely damp.

Naturally the entire building will gradually try to reach a condition where the moisture content of materials will become normal. Until this has been accomplished it is advisable to allow as much free circulation of air as possible throughout the entire house. Closets generally have no outside windows and can be aired out only through the doors. Cellars and attics especially need airing and ventilation.

*Q. What Causes Solid Panels to Show An Unpainted Line Around Edges?*

A. Whenever this occurs it is a sure sign that the doors or panels have less moisture content than they had when they were painted. There is only one way to prevent this and that is to have the doors as dry as they ever will be at the time they are painted.

This is another good reason why woodwork should never be stored or installed in a house until the house is dry. Painting doors during or soon after extremely damp weather should also be avoided. When unpainted lines do show around the panels it would be a good idea to find out if your heating plant is making your house too dry.

*Q. How Can Woodwork in a House Shrink in Winter When the Windows Steam and Frost?*

A. This can best be illustrated by an actual problem. (See Question 6, Page 8, and Question 7, Page 35 in this book for tables and formula used.)

It is not uncommon to have at least 50% or 60% relative humidity in summer when a house is built. It may even be more when plaster is still wet.

From the table on Page 8, 60% humidity will put about 11% moisture content in woodwork.

In winter when a house is heated the relative humidity in the house may be 25% to 35%. This is good standard practice; 35% in milder weather and 25% in colder weather.

From this same table; 30% relative humidity will produce about 6% moisture content in woodwork.

Now let us check up:

11%—6% = 5% moisture change in the woodwork. From Page 35 an average piece of Ponderosa Pine 1″ wide will shrink .0022″ for 1% moisture change. 5 x .0022 = .011″; the expected shrink in a 1″ wide board, and for a 5″ board it will be .055″ or about $\frac{1}{16}$″. This explains why woodwork may shrink. Now refer to chart, Question No. 2, Page 20. This will show that on windows without storm sash and 30% relative humidity in the house frosting will begin when outside temperature is 20°.

On windows equipped with storm sash under the same conditions frosting of the inside glass will not begin until the outside temperature is around -40°. (This is an assumption of still air; in windy weather it will be somewhat higher temperature).

But remember that the inside sash are not 100% tight. Moisture will flow past them and frost the storm sash to some extent. How much they frost will depend upon four things: outside temperature, looseness of the inside sash, amount of humidity in the house, and direction of wind. Windows on the windy side of the house will frost much less.

# HUMIDITY

*Q. What Is Humidity, Absolute and Relative Humidity?*

A. Humidity makes certain hot days oppressively uncomfortable. Air always contains a certain amount of water vapor. When it contains an excessive amount we say it is "humid" or "muggy" or "close."

Humidity is the term used to describe the moisture present in air or atmosphere. The **absolute** humidity of the atmosphere is the mass of water contained per unit volume. The **relative** humidity of the atmosphere is the ratio of the quantity of water vapor present, to that which would be necessary to bring about the condition of saturation.

Warm air will hold a larger quantity of water vapor than cold air. This accounts for the condition sometimes encountered of windows frosting at night and clearing off during the day time. The temperature of the room drops a few degrees at night and the air which contains a fairly high per cent of relative humidity gives up a portion of its moisture which condenses and freezes on the cold window pane.

*Q. What Relative Humidity Should I Maintain in My Home?*

A. This question depends on the conditions of each particular case. Generally speaking, a relative humidity of between 30% and 50% insures comfort. It has been previously shown (table showing relative humidity and moisture content—page 8) that woodwork and furniture exposed to a uniform, relative humidity will attain a certain moisture content. Wood exposed to the range of 30% to 50% relative humidity will attain a moisture content of 6% to 9%. This is the range to which most wood is dried and will insure against excessive expansion or contraction.

*Q. How Can I Determine the Humidity in My House?*

A. A common method of determining relative humidity is by means of wet and dry bulb thermometers and a chart. These instruments are called Hygrometers and can be purchased. One type is made for wall mounting and contains two thermometers. A water container and a wick keeps the bulb of one thermometer wet. The drier the air is the faster the water will evaporate from the wick around the bulb. When water evaporates it produces a cooling effect which is recorded by this thermometer. The hygrometers should be fanned for several minutes before taking a reading to secure the proper reading of the wet bulb thermometer. When the readings of the dry and wet

## RELATIVE HUMIDITY CHART

| Dry Bulb Temperature Degrees F. | | | | | | | | Difference Between Dry and Wet Bulb |
|---|---|---|---|---|---|---|---|---|
| 60 | 65 | 68 | 70 | 71 | 72 | 75 | 78 | 80 | |
| Relative Humidity % | | | | | | | | | |
| 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 0 |
| 88 | 90 | 90 | 90 | 90 | 90 | 90 | 92 | 92 | 2 |
| 78 | 80 | 80 | 82 | 82 | 82 | 82 | 82 | 84 | 4 |
| 68 | 70 | 72 | 72 | 72 | 74 | 74 | 74 | 76 | 6 |
| 58 | 60 | 62 | 64 | 64 | 64 | 66 | 68 | 68 | 8 |
| 48 | 52 | 54 | 54 | 56 | 56 | 58 | 60 | 60 | 10 |
| 40 | 44 | 46 | 48 | 48 | 48 | 50 | 52 | 54 | 12 |
| 29 | 34 | 38 | 40 | 40 | 42 | 44 | 46 | 46 | 14 |
| 21 | 27 | 30 | 32 | 32 | 34 | 36 | 40 | 40 | 16 |
| 13 | 19 | 23 | 25 | 27 | 28 | 30 | 32 | 34 | 18 |
| 5 | 13 | 16 | 19 | 20 | 21 | 24 | 27 | 29 | 20 |
| | 5 | 7 | 12 | 13 | 15 | 18 | 21 | 23 | 22 |
| | | 3 | 6 | 7 | 9 | 12 | 16 | 18 | 24 |

### HOW TO USE CHART

Read and record temperatures of wet and dry bulb thermometers.
Subtract wet bulb reading from dry bulb reading to secure difference.
To determine relative humidity, locate dry bulb temperature at top of chart and difference in right hand column.
The relative humidity corresponding to those two readings will be found at the point of intersection of these two columns.

**Example**

Dry Bulb 72 Wet Bulb 58.
By subtraction 72 — 58 = 14 = Difference.
Read relative humidity under 72 (DB) opposite 14 (Dif.) = 42.

bulb thermometers are taken, a reference to the following chart will show the relative humidity.

There are several other types of instruments which depend upon the shrink and swell of a hair, a piece of wood, or other material, and have a pointer that indicates the humidity on a scale. These are handy but generally not very accurate.

*Q. What Is Healthful Humidity?*

A. Average summer weather may run around 50% relative humidity without feeling oppressive. When dew falls in the evening the humidity must be 100% since the air cools to the point where it must drop some of its moisture. Few people complain about excess humidity at that time. So it seems we manage to get along at almost all degrees of humidity and feel comfortable as long as the temperature isn't too high. High humidity, and heat at the same time, is disagreeable.

Air with 40% humidity at 100°F. actually contains as much water by weight as 70° F. air at 100% relative humidity. (See table).

*Q. How Can Excess Humidity Be Corrected?*

A. Conditions will vary for different houses. Houses with loose windows and porous walls rarely will build up a humidity that is too high.

Naturally the first thing to correct, if there is too much humidity, is to reduce or eliminate entirely the addition of moisture by the heating plant. If the humidity is still too high the only remaining logical thing to do is to ventilate. This means letting out the moist air and letting in dry air.

This can best be accomplished through the heating plant by letting some fresh outside air into the cold air side of the system. If moist air is to be let out it can best be done through a ceiling scuttle or grille to the attic space and from the attic by means of louvres. Do not let it into the attic without letting it out of the attic.

# PROPER HANDLING OF DOORS

*Q. What Can Be Done to Protect Doors from Weather?*

A. Keep them inside the house.

A few years back most people kept their doors in under a stoop or porch. That was a practice dictated by experience. In recent years many houses have no porches and the doors are exposed to all kinds of weather. Perhaps a new generation will again learn by experience.

If doors must be exposed to the weather, proper finishing with three coats of lead and oil paint or an

equivalent treatment with stain and spar or other weather resisting varnish is about the best surface covering they can get. Tops and bottoms of doors should be painted the same as the outside.

Exterior exposure can be reduced by using combination or storm doors. It is extremely hard on exterior doors to have winter conditions on one side and heated room conditions on the other. Any sort of recess, alcove, or shelter that tends to keep weather extremes from the door is beneficial.

*Q. How Can Door Frames Be Checked to Assure Straight Doors?*

A. If a door when hung does not fit the frame it will undoubtedly soon become warped. The fault is quite often in the frame instead of the door. Be sure that the frame is straight.

To check a door frame before hanging the door the best procedure is to use a reliable straight edge.

1. Hold it against the edge of the jambs to see if both jambs are straight.

2. Hold it against the inside face of each jamb and near both edges.

3. By use of accurate carpenter's level held on straight edge make sure all above faces are plumb. Keep same side of straight edge and level always pointing same direction (north, south, etc). This will avoid possibility of error in tools permitting a warped frame to appear straight, or a straight one to appear warped.

4. In absence of a level or straight edge an ordinary line and plumb bob can be used with excellent results. Sight the jamb to see if it coincides with the line.

*Q. How Much Clearance Should Doors and Windows Have When Fitted?*

A. First answer these questions.

How much variation is there in the setting of the frames? How wet or dry are the frames? Are the doors or sash thoroughly dry? What season of the year is it? Is it dry or damp in your locality? What sort of heating do you use?—and a dozen others.

A sash will operate nicely with about $\frac{1}{16}$" total clearance but, since this will vary with shrink or swell, more clearance is required in fitting. If installed when wet, then the sash may be fitted closer than when all parts are dry. Allowance for paint in the runs should also be made. It is possible to have as much as $\frac{3}{16}$" total variation in sash and frame due to shrink and swell. With proper types of weatherstripping more clearance can and should be provided. $\frac{1}{8}$" to $\frac{3}{16}$" is fair practice.

Doors offer a problem just as complex. Doors may shrink or swell as much as $\frac{5}{16}$" or more from extreme damp conditions to a baked out winter condition with dry heat. These, of course, are extreme conditions but they are not uncommon where no efforts at regulation are made. If $\frac{1}{16}$" clearance at each side of a door could be maintained

on a properly beveled door it would be ideal. If jambs are damp from plastering, the door may well be hung with about this clearance.

*Q. How Much Can a Door Be Cut Down Without Injuring It?*

A. This depends on how much door you have to start with. Usually it should be left large enough to fit the door frame and enough of the stiles left to properly receive the hinges and mortis locks.

On panel doors more materials can be cut off solid stiles and rails than where veneered stiles or rails are used. In general, we would say that any panel door should not be trimmed down from one stock size to the next—usually 2″ in width and 2″ in height. Cutting down a door will most certainly change its proportion and alter its architectural design. Cutting into dowels in definitely damaging.

Flat slab doors may be so built that they can be trimmed about 3″ on all four edges and tops made rounded, Gothic, etc., but do not take it for granted that all slab doors are built that way.

The safest rule is to fit the door only to the size of frame for which it is built.

*Q. How Should a Door Be Hung to Offer the Greatest Protection Against Warping?*

A. Almost without exception any door will have some slight bow or curvature. It should not be alarming to find that when a straight edge is placed across a face of the door there may be as much as 1/32″ or $\frac{1}{16}$″ of daylight showing under the center. Association rules do not consider anything up to $\frac{1}{4}$″ bow in the door height as a defect.

If any such slight curving is present select the side that shows hollow and always, if possible, hang the door so that side will be toward the door stops on the jamb. Also the most bowed side should be the hinge side if possible. Every door should have 3 hinges. Be sure they are properly attached to the jamb so all the pins are in an exact straight vertical line. Also, be sure that on the hinge side there is enough clearance to prevent binding against the jamb or stop. *Mortise the lock exactly in the center of the stile and do not cut the mortise over width. Put on the strike plate to give about 1/32″ play.

In general the sides and top of door should be beveled off about $\frac{1}{16}$″ toward the stop side of the door. There should be no binding or rubbing of door when closing. Top and bottom of door should be finished and painted to help prevent warping.

*See also next question.

*Q. How Should a Door Stile Be Mortised for Lock?*

A. There is not much need of telling a good carpenter how to prepare a mortise for a lock in a door stile. There are just a few precautions that might be observed. Locate the position of the mortise carefully so it need not be shifted or cut oversize. The wood in a door stile is precious since wood removed at this place means taking away strength at the spot where it is most needed. When boring the first holes be careful not to bore deeper than necessary and bore straight. Unless this is done strength may be taken needlessly from the door stile. In use of chisel or tools do not treat the door too roughly. The finished lock should go into place without binding.

If a door warps you may well place some of the blame on the cutting out of the wood for the lock.

*Q. How Can One Measure How Much a Door Is Warped?*

A. First we must have a reliable measuring stick. We trust it isn't a twisted, bowed or crooked frame into which the door is expected to fit. We recommend a straight edge long enough to reach from corner to corner of the door. If a reliable straight edge is not handy, a string can be used. Stretch it from corner to corner, across the surface being checked. Always find the hollow side of the door, lay on the straight edge and measure the greatest clearance between it and the face of the door. Do this along top, bottom, and the two sides. This will measure the warp or bow. If one edge of the door bows out and the other in, it should be so stated.

Now lay the straight edge from corner to corner—in two directions. The difference, if any, in the measured clearances will equal one-half of the twist in the door.

# HANDLING AND TREATMENT OF WINDOWS

*Q. When Is the Proper Time to Install Windows in a Building?*

A. Sash should never be installed when the building is wet and damp. This is especially true in cold weather when heating of the building produces a high humidity and causes water and frost to settle on the glass, soaking the wood parts of sash and frame. In the summertime when the windows may be kept open continuously this may not be so serious.

The ideal way is to first close up the building by the use of storm sash. When all plastering is done and the house is dried out and ready for the trim is the ideal time to put in the sash. Sash always get some abuse if they are in place during plastering. The sash and frames should have, at least, a good prime coat of paint before installation.

When storm sash are not available the building may be closed by use of cheese cloth nailed over the window open-

ings. This keeps out weather and allows ventilation. Improper care of windows during installation may cause blue stain or decay later, should windows be allowed to absorb too much moisture from wet plaster.

*Q. What May Be Done to Prevent Leakage at Check Rail?*

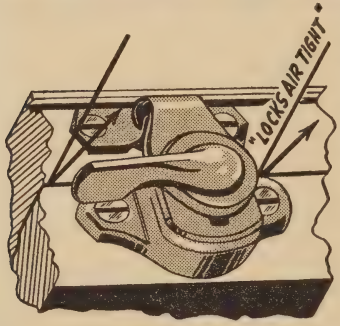
A. Weatherstripping of a sash check rail is a matter of opinion. In the majority of cases we believe factory fitted weatherstrip on the check rails would cause dissatisfaction.

For this reason Silentite sash have never been factory fitted with weatherstrip at the check rail. CURTIS uses a rabbeted joint at the check rails and has developed the improved CURTIS check lock for drawing the check rails tightly together. Some wide sash should have two check locks applied on them.

In actual tests it has been found that the leakage through properly locked check rails is less than 15% of the leakage through the rest of the window, so it can be ignored. In those instances where certain folks think the check rails need weatherstripping CURTIS offers a suitable strip for their use, as an extra.

*Q. Why Use Proper Check Rail Locks?*

A. On any double hung window it is important to draw the check rails tightly together. Some of the very earliest types of check locks were actually designed to do this. For some reason, probably low cost, check locks have gradually become standardized in the form of the crescent or eccentric type. On sash which have relatively little side clearance this type of lock has about a 50-50 chance of doing its work; half of them probably don't get an even break.




The Silentite window has about 3/16" of side play for the sash and the crescent type of adjuster often will push the sash apart rather than pull them together. For this reason an old principle in sash locks was improved to take care of side shift of the sash; result, the Curtis Improved Check Lock. The hook swings freely behind the strike plate and then pulls the sash straight together.

*Q. What May Cause Water Leakage Around Glass?*

A. The putty must have become loosened from the glass, or the wood, or both. CURTIS sash are dipped in an oil solution to assist the putty in adhering to the wood. A putty anchor groove also is provided, along with a

putty trench on the back side of the glass. It generally develops on leaky sash that the putty has lost its hold or contact with the glass. Dropping or jarring of the sash may cause this but more often it is caused by wetting and excess swelling of the wood of the sash before they are properly painted. Since the loose joint generally occurs at the bottom side of the glass it indicates water is the cause.

In painting the sash the paint should always extend over the putty and up about 1/32″ on the face of the glass. Putty will not permanently lay tight against the glass without a paint seal across the putty to glass joint. Once water gets between glass and putty the joint will soon open up full length. Paint the joint. Even if you think it doesn't look as well, it does seal and protect the joint.

*Q. Why Does Some Putty Fall Out of Sash?*

A. Proper glazing of sash requires that putty shall retain its oils. Sash, if not oiled before putty is applied, will tend to absorb the oils from the putty too rapidly. Primeless putty was designed to prevent this by quick formation of a surface skin. This was found to be only a partial solution. The best practice is to dip the sash in oil primers before glazing.

Frequently trouble begins by handling the sash or delivering them too soon after glazing. Careful manufacturers try to avoid this and aim to deliver only properly seasoned sash. Avoid rough handling or jarring of sash.

Much of the trouble is caused by failing to paint the sash properly and allowing them to get wet. Swelling of the wood will loosen the putty. Proper painting also requires that the paint must thoroughly cover the putty and even extend upon the glass about 1/32″ or $\frac{1}{16}$″ to seal the glass to putty joint. In cleaning windows do not scrape the paint off too close to the putty joint.

Keep the sash well painted for best results.

*Q. What Is Best and Easiest Way to Clean Putty Stains from Glass.*

A. It's just too bad that windows cannot be glazed without leaving some putty marks on the glass. It doesn't seem possible, however. If you have tried to putty in a light of glass yourself, the reason will be more easily understood.

Glass should never be cleaned until the putty is thoroughly set. The easiest way to remove putty marks is to first rub the glass with a perfectly dry clean cloth. This will remove the stains without smearing. The glass may then be washed or cleaned in the usual way. A cloth moistened with naphtha will remove any stubborn spots.

We do not recommend that razor blades be used in cleaning windows. If they are used be careful that you do not jam a blade against the place where the putty joins the glass, such treatment is quite sure to develop a leak. Avoid using scouring powders that will scratch the glass.

*Q. Should Windows Be Raised or Lowered by Means of Check Rail or Bars?*

A. The practice of raising or lowering sash by taking hold of the bars or check rails is bad. There is always a possibility of loosening the putty around the glass. On single light sash especially, the check rail putty to glass seal can very easily be broken. Also, the paint on the sash may become soiled from wet or damp hands. It is better practice to use the handles or lifts. On the upper sash, no handles are provided so, after all, this becomes a question of good judgment on the part of the tenant. Use both hands and push or pull only near the sides of the sash—not at the center of check rails.

*Q. What May Cause Silentite Windows to Stick?*

A. There's always a reason if they do stick. We might suggest a few of the more common causes.

1. The jambs might have been installed with a bow in them so that they actually bind the sash. The jambs must be straight.

2. The weatherstrip in the sash may not have been seated when the locking screws were inserted causing the strip to project and ride hard on the bottom of the liners in the jambs.

3. The channels may have paint or varnish in them, making them gummy. Stain is equally bad. The new flanged channels will help eliminate this cause.

4. The parting bead may not be seated properly and the notch in the check rail may be rubbing on the top of it or the stops may be set up too close. When Silentite sash are installed right they have to work. Check on the installation before blaming the window.

*Q. How Are Silentite Sash Kept Operating Easily and Smoothly?*

A. It is, of course, important to keep the channels and weatherstrip of Silentite double-hung windows clean in order that the sash may slide freely. Wet paint can be wiped out with a cloth moistened with kerosene. If the sash has been operated with paint in the channel then it should be removed and the weatherstrips cleaned. Paint or varnish that has become hardened or set in the channels may be scraped out with a knife or screw driver or it may be removed with a bit of fine sand paper. Always finish the job by wiping channels with dry cloth. Do not oil the weatherstrip. Should the weatherstrip ever work hard, it can readily be cleaned with a dry cloth. If any black deposit is noticed in the channel sections, it can be removed by wiping with a cloth moistened with benzene or naphtha.

Sill rib type weatherstrip, if used, should line up with the groove in the sash when the sash is centered in the runs. It should be kept free of paint.

*Q. How Can Weight of Standard CURTIS Sash Be Calculated?*

A. Find weight of glass as follows: (All measurements in inches). Multiply glass height* x glass width* and put decimal point two places from right.

For SS glass subtract 20%.
For DS glass or ⅛" plate add 20%.
For Thermopane use double SS value.
For ¼" plate use double DS value.

B. Find weight of wood and putty as follows: Add glass height plus glass width plus 4" and put decimal point one place from right.

For 1⅛" sash, subtract 10%.
For 1⅜" sash, use as it is.
For 1¾" sash, add 30%.

Total weight of sash is sum of the two above mentioned values.

Slight difference between top and bottom sash is negligible.

*For divided light sash use overall glass dimension as though it were one light.

Example—Find weight of a sash 1⅜" SS 24"x28" glass.

Solution: A =24x28 = 672, point off
= 6.72 — 20% = ..... 5.38 lbs.
B = 24 + 28 + 4 = 56,
point off 5.6 = ..... 5.6

Total sash weight ..... 10.98 lbs.

Example—Find weight of sash 1¾" DS 24x24 glass.

Solution: A = 24x24 = 576, point off
= 5.76 + 20% = ..... 6.91 lbs.
B = 24 + 24 + 4 = 52, point
off 5.2 + 30% = ..... 6.76

Total sash weight ..... 13.76 lbs.

# WINTER WINDOWS

*Q. Is Condensation on Windows Caused by the Weatherstrip or by the Heating Plant?*

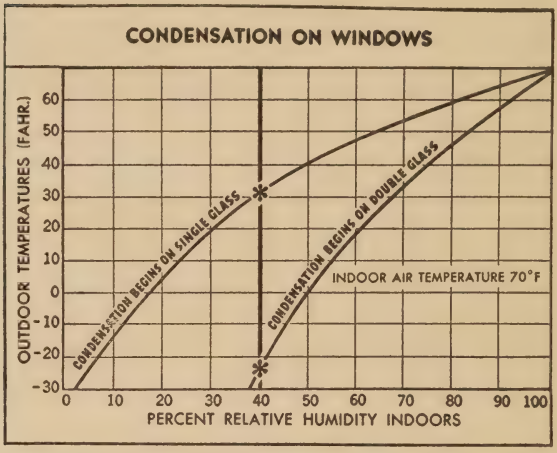
A. Neither—and both! In talking about condensation we must consider two factors—a window glass that is too cold, and room air with a dew point temperature higher than that of the glass. The solution is either to "insulate" the window by use of storm sash to keep the inside glass warmer, or to reduce the amount of moisture in the room air.

The cause of cold glass is obvious. In most cases of excess condensation (with outside temperature at 32°F. or less) storm sash or winter windows should be used. Their use is justified on basis of heat saving alone.

The presence of too much moisture in the air may be caused by lack of ventilation, excessive moisture from ordinary household operations such as washing and cooking, or too much humidification through the heating system.

*Q. What Temperatures and Humidities Will Cause Window Condensation or Frosting?*

A. This is best answered by a chart published by Libbey Owens Ford Glass Co. The comments below the chart are theirs. Direction and velocity of wind will cause some variations. The chart is probably for relatively still air condition.




This chart shows that "Window Conditioning"—storm sash—prevents condensation and fogging of windows when a healthful humidity of 40% is maintained indoors until the outside temperature reaches nearly 26°F. below zero. In such severe weather it is difficult to maintain 40% relative humidity, therefore, condensation rarely ever appears on windows in the "Window Conditioned" home.

*Q. Why Would Storm Sash Frost Over on a Job Completed the Previous Spring?*

A. For exactly the same reason that they might frost over at any time.

There is nothing about the age of a building that tends to prevent frosting except that a newly built house will almost always have more moisture released from plaster, lumber and masonry than one that has dried out.

It must be remembered that there are other sources of moisture, and it is excess of moisture in the inside air that causes frosting. When excess frosting occurs it is always necessary to find out the cause and remove it. Sometimes ventilation is the proper solution.

Tight windows are still so uncommon that most people don't understand that they help hold more moisture in the house.

(Editor's Note—Just as this question was submitted CURTIS engineers finished checking a house because of this same complaint. They found 38% relative humidity in the first floor rooms and 65% in the attic. Remedy — less water in the furnace pan and ventilate the attic.)

*Q. What Is the Value of Storm Sash?*

A. Storm sash serve useful purposes.

1. They act to reduce drafts when applied over ordinary non-weatherstripped windows.

2. They double the thickness of glass through which heat or cold must travel.

3. They provide added air films to resist passage of heat or cold.

4. The use of storm sash divides the temperature drop between two panes of glass and thus reduces condensation or frosting on the glass. Condensation is apt to raise the moisture content of the wood in the sash high enough to start the growth of blue stain or decay fungi.

5. The fuel saving by use of storm sash has been variously estimated from 10% up to 30%.

*Q. Would It Be Practical to Eliminate Screens Entirely, and Install Storm Sash for Use Permanently, Winter and Summer, in a Thoroughly Air Conditioned Home? What, If Any, Effect Is This Going to Have on Interior Trim, Cabinets, Doors, etc.?*

A. In a thoroughly air-conditioned home you might do away with windows entirely. However, most people still want to look out occasionally and they also wish to enjoy open windows and the outside air during favorable weather. There is little use or sense in manufacturing weather when nature provides the right kind free. We can't believe many homes will ever depend upon manufactured weather all the time. Until then we will still want to open the windows and we will need screens.

An approach to this might be had by use of storm sash with screened Protectorvents. A still better way is to use the new Silentite Casements with insulating glass and screen installed the year round. Both glasses of the window are more easily cleaned and the double glass and screen feature does not detract from the appearance.

The effects of air-conditioning on the inside of the house will depend entirely upon how intelligently the plant is operated. Good operation will mean good results.

*Q. Is Double Glazing Practical?*

A. Use of two thicknesses of glass in window construction is practical. There are, however, several impractical ways of doing it.

CURTIS does not think that two panes of glass puttied permanently in the same sash is a practical solution because—among other problems—there is no way to keep such glass clean.

Wherever double glazing is used there should be a means of cleaning the space between. Generally this involves use of two separate sash frames. One sash may be applied as a storm sash on the oustide, or it may

even be fitted to move with the inside sash. In the latter form a metal frame may be used. Any joint between such two sash frames should be as tight as possible preventing air entrance from the room. Ventilation of the space between such two glasses with outside air will aid in reducing frosting or condensation. In the new CURTIS Silentite casement a ¼" hole may be bored in the bottom rail from this space diagonally to the outside.

Two panes of glass spaced apart, filled with dry air and sealed air-tight, work well but are expensive. Even this will fog up in time.

*Q. Does Glass Offer Much Resistance to Flow of Heat?*

A. Double strength glass is about ⅛" thick. Single strength glass is about 1/11" thick. The difference in heat transmission is about 3/10 of 1%.

Actual tests show that most of the resistance to heat flow through glass is not in the glass itself but in the still air films that lie close to the two surfaces. In a test made jointly by members of the staffs of the Pittsburgh Plate Glass Co. and the Pittsburgh Testing Laboratory, it was demonstrated that with 70° air on one side of a pane of glass and —30° on the other side, a total of 100 degrees difference, there was only about 2° difference in the temperature of the two surfaces of the glass. About 98% of the total resistance was in the air films. These tests were in relatively still air. On a windy day an exposed pane many have one of these films blown off and lose nearly half of its resistance to heat flow.

This explains the need for storm sash or double glass to retain at least three still air films instead of only one on the windows on windy days.

# HEATING AND INSULATION

*Q. What Savings May Be Expected by Use of Various "Extras" Such As Weatherstripping, Insulation and Storm Sash?*

A. We copy below a chart which is self-explanatory. Libby Owens Ford Glass Co. make the following comments on Prof. Larson's chart.

"He found that every step he might take toward saving fuel in his home paid for itself in time, but that "Window Conditioning" (storm sash and storm doors) returned its cost first.

"An investment of $106.00 showed a net saving of $77.40 per year—a return of 73% on his money! It would pay for itself before the second winter was half over. No other method produced such a high return. That is why "Window Conditioning" is the FIRST step to winter comfort.

"It is worth while noting that Professor Larson would save $88.00 in fuel every year after paying for his "Window Conditioning." If he had included it when he built the

house originally, he would have saved $488.00 in the cost of his heating plant, or actually cut his house cost $382.00. And still he would have saved $88.00 every year on fuel!

"Of course such figures vary widely with every house and with every location. You are naturally less interested in what Professor Larson found than in what "Window Conditioning" will do for you and your pocketbook."

## Fuel Savings From House Insulation

**By Prof. G. L. Larson, University of Wisconsin**

Published in American Builder Magazine, June, 1937.

| | Ordinary Construction | ½" Insulation on Exposed Ceilings and Walls | Weather Stripping only (Doors and Windows) | 4" Insulation on Exposed Ceilings and Walls | Storm Sash and Storm Doors Only | ½" Insulation (Walls and Ceiling) Plus Storm Sash and Doors | 4" Insulation (Walls and Ceiling) Plus Storm Sash and Doors |
|---|---|---|---|---|---|---|---|
| Total Heat Loss B.t.u.'s. | 159,175 | 139,974 | 125,741 | 118,773 | 110,383 | 91,182 | 69,981 |
| Percent saving | .... | 12.1 | 21.0 | 25.4 | 30.8 | 42.7 | 55.9 |
| Sq. Ft. H. W. Radiation | 1060 | 932 | 837 | 791 | 735 | 608 | 466 |
| Fuel per season, gals. | 3980 | 3499 | 3143 | 2969 | 2759 | 2279 | 1750 |
| Cost of fuel per season | $266 | $252 | $226 | $214 | $198 | $164 | $126 |
| Saving in fuel | ..... | $ 34 | $ 60 | $ 72 | $ 88 | $122 | $160 |
| Cost of Construction | ..... | $142 | $129 | $284 | $106 | $ 248 | $390 |
| Interest & Depreciation on investment | ..... | $9.94 | $9.03 | $19.88 | $10.60 | $20.54 | $30.48 |
| Net Saving | ..... | $24.06 | $50.97 | $52.12 | $77.40 | $101.46 | $129.52 |
| Percent return on Investment, net | ..... | 16.9 | 39.5 | 18.3 | 73.0 | 41.0 | 33.4 |
| Years for net fuel saving to pay off investment | ..... | 5.9 | 2.53 | 5.45 | 1.37 | 2.45 | 3.01 |
| Cost of heating plant | $1590 | $1398 | $1256 | $1186 | $1102 | $912 | $699 |
| Reduction in plant cost | ..... | $192 | $334 | $404 | $488 | $678 | $891 |

**The house to which these calculations were applied is two stories high with unfinished attic space. It contains 8 rooms and bath above the basement and is of frame construction, with a concrete foundation. Windows were assumed to permit air leakage equivalent to two air changes per hour. Storm sash was assumed to reduce this air leakage one-half. Heat season 260 days. Oil at 7.2c, 140,000 Btu, operated at 65% efficiency. Coefficients: Walls, .26, glass 1.13, double glass .45, ceiling .30, floor .34.**

*Q. What Fuel Savings Are Possible by Using Better Construction?*

A. If you were to add up all the guaranteed fuel savings of all the products that may go into a house you would, no doubt, find that apparently no fuel at all is required.

It is hard to arrive at any definite figure on fuel savings because so much depends upon what is considered average or ordinary construction. In other words, the starting place is so indefinite; and, likewise, the extent to which one may wish to go in the way of fuel saving devices and materials is limited only by the money one may wish to spend.

But taking an ordinary house without any insulation, ordinary fitted non-weatherstripped windows, doors, etc., we think it is entirely within the realm of economical building to construct a second house of the same size that will require less than half the fuel to heat it comfortably.

*Q. Does Type of Heating Plant Affect Woodwork?*

A. No, but the way it is operated may! Satisfactory results may be had from any of the various types of heating plants provided they are correctly designed, installed, and operated.

Steam or hot water systems with radiators in the rooms may concentrate too much dry heat on adjacent woodwork. Proper location of radiators and use of humidifying apparatus is important.

Gravity systems of hot air are most simple and if properly installed with adequate sizes of pipes, cold air returns, and water pans, will give good results in moderate sized homes.

The forced air systems now available with air filters, automatic humidifiers, etc., should give excellent results.

The kind of fuel used has little or no effect on woodwork. The decision on this is primarily a matter of cost and convenience.

All heating plants should be able to supply and maintain a proper amount of humidity in the heated rooms both for health and the woodwork.

*Q. Is Wall and Ceiling Insulation Sufficient?*

A. In recent years the public has become insulation conscious. The use of various kinds of insulation in walls and ceilings has become common practice.

For years heating engineers have recognized that upwards of 40% of all the heat lost from a house may escape through the windows. It is a fact that the average window area may be only one-fifth of the entire heat losing area of a house and that a window usually allows four times as much heat to escape per square foot as compared with walls.


It is possible to save up to one-third of all the heat by "insulating" only the windows which may be only one-fifth of the wall area. Certainly when so many people believe in insulating the walls it is doubly important to "insulate" the windows.

The answer to the question is "No!"

*Q. How Is the Behavior of Water Vapor Affected by Modern Wall Insulation?*

A. Water vapor always tries to escape out through walls and ceilings when outside temperatures are colder than inside temperatures.

In a wall which is warm on one side and cold on the other side there will be a gradual lowering of temperature in the wall towards the outside. Water vapor flowing through a wall from the warm side may eventually reach a zone in the wall which is cold enough to condense the vapor.

In frame construction walls the vapor seems to escape without greatly wetting the wall although we often see paint that apparently has peeled because the siding has

gotten wet on the inside. Where "fill" or "bat" insulation has been put in the space between studs the condensing zone may be right in the insulating material itself. This, of course, is bad practice.

More recently insulating manufactures have developed use of "moisture barriers" or moisture resistant envelopes for the insulating material. This will keep the insulation dry and it also greatly reduces outward flow of water vapor through the walls. Such insulation should give better results if applied closer to the plaster side of the studding wall space than if placed out near the sheathing.

*Q. How Is the Behavior of Water Vapor Affected by Weatherstripped Windows and Doors?*

A. In the old type of house construction water vapor could quite readily escape from inside the house. It would get past loose sash and doors and through the walls themselves.

Use of weatherstripping for doors and sash greatly reduces the flow of moisture from the house. It also prevents entrance of much cold outside air which is relatively dry and which helps to dilute the moisture content of the inside air.

The net result is that it is always easier to maintain a higher humidity in a weatherstripped house.

*Q. Are There Moisture Condensation Problems in Houses That Are Weatherstripped and Insulated?*

A. Old-fashioned houses of a few years ago, because they permitted excess vapor moisture to escape past leaky windows and through porous walls, required the addition of a great deal of moisture to the air through the heating plant.

Modern hot air or circulating air heating plants are capable of adding more moisture to the air than is necessary or desirable when the house has weatherstripped windows or insulated walls, or both.

Naturally in any house if there is excess moisture or humidity the moisture will condense on the coldest surface it can contact. Single glass windows will naturally be colder than the rest of the walls and often a manufacturer is blamed because the house tenant thinks there is something wrong with the windows.

Use of storm sash will "insulate" the windows so that the temperature of the inside glass may be at all times no more than 10° to 15° colder than the walls.

*Q. Does Water Vapor in the Air Spread or Flow Independent of Air Movements?*

A. Boiling water produces a vapor known as steam. If it is confined, as in a boiler and more heat applied, it increases in pressure.

In a similar manner water at ordinary air temperature will evaporate and produce vapor which will mix with

and exist in the air. It always has enough pressure so that it tries to spread and mix with air in ever increasing space. The higher the temperature of the air, the higher will be the vapor pressure and the more readily it will try to flow to any place where air exists at a lower temperature. This flow may be entirely independent of apparent air movements.

It is this tendency for water vapor to flow from a heated room to colder outside space that causes it to leak past inside sash and out to colder storm sash where the cold glass may cause it to condense as frost.

It also will flow quite readily through ordinary plaster and older types of wall construction.

*Q. Will Air Conditioning Affect Woodwork?*

A. Yes—it should be good for it, if used intelligently. By air conditioning we mean a system which constantly draws air from each room, adds a required amount of heat and fresh air, filters or cleans it and sends it back again, constantly supplying the correct amount of heat (or cold) and moisture to keep the rooms at proper healthful temperature and humidity. It is hard to conceive a condition where woodwork could be more favored. In this connection it should be said that the whole structure of the house should be built to suit air conditioning.

There may be a temptation to run the humidity a bit too high during cold weather. One company advises from 25% to 30% relative humidity as the top in cold weather. More will tend to cause frost accumulations in the walls and on windows. For best results double glass or storm sash should be used and moisture resistant insulation is desirable for the walls to keep moisture from settling in them.

*Q. How Much Ventilation May a House Need?*

A. Enough—several things may determine how much. To most people ventilation means admission of enough air to insure health. To a few it means drafts and a thing to be avoided. A rule established by ventilating engineers calls for admission of about 10 cubic feet of outside air per minute, per person.

Accumulation of too much humidity is often caused by too little ventilation. Excess steaming or frosting of windows may be reduced by increasing ventilation. Attics sometimes are built so tight by use of paper under the shingles, and with no means of ventilation, that excess moisture and frost will accumulate in a quantity great enough to actually damage the ceilings below. A safe rule is to ventilate enough to make the house healthy and comfortable, free of odors and excess moisture.

# CURTIS KITCHEN UNITS

*Q. Can Kitchen Units Get Out of Square?*

A. They can go crooked just like many other things. CURTIS endeavors to make them true and square. We try to deliver them to the job in as near perfect conditions as careful packing and handling will permit.

Even though they are perfectly square or true they may sometimes be set up on a floor out of level or screwed up against a wall that isn't exactly straight. There have been instances of complaints where builders have said the cupboard doors were crooked. Examinations revealed that the doors were O.K. but the cases were drawn out of square during installation.

Cases should be checked with a straight edge and plumb.

*Q. Will Cabinet Doors Warp?*

A. The easiest door to build and the one that will remain the straightest under varying weather and humidity conditions is a panel door. It is from experience with this type of door that the public has established its ideas of door performance. In more recent years the demand for flat faced slab doors has increased without a realization that doors so constructed present entirely different problems than the door with which they have been familiar.

It will probably never be possible to build a flat slab door that will remain absolutely straight and flat under all conditions to which it may be subjected. Improvements in construction are constantly being made, and, no doubt, such doors will continually be made better and better. Slight warping or bowing of slab doors can reasonably be expected.

*Q. What Care Should a Linoleum Top Receive?*

A. A cold, clear water rinse, after the sink has been used each time and cleaned with ordinary soap and water, is all that is necessary to maintain a linoleum sink top in perfect condition over a period of years.

A small quantity of boiled linseed oil, rubbed on occasionally will maintain the fresh appearance of the linoleum colors.

Wax should not be used as a dressing for linoleum sinks; first, because most waxes are not sanitary, and secondly,

most waxes, particularly floor waxes, are water soluble, and soapy water emulsifies the wax and makes the top appear spotted.

Very strong alkalies such as lye or Drano for the cleaning of stopped-up waste pipes, should not be used on linoleum. These will bleach out the color on the surface. If, however, lye or Drano should accidently be spilled on the drainboard, bleaching out the color at that point, all that is necessary is the removal of the bleached portion of the linoleum with steel wool. Only the very thinnest top surface of the linoleum would be affected.

*Q. Does Linoleum Soak Up Water and Other Liquids?*

A. One of the chief ingredients of linoleum is oxidized linseed oil. Linoleum can be totally submerged in hot water for long periods of time without soaking up any of the water. The only liquid which linoleum will take up is boiled linseed oil which replaces the linseed oil in the linoleum which is further oxidized out of the linoleum when the counter top has been in use for a considerable length of time. Boiled linseed oil in this case acts as a rejuvenator and instead of being harmful is decidely advantageous.

*Q. Can the Height of the Working Surface or Counter Top Be Altered?*

A. It can be altered by changing the foundation or toe strip. A working surface height of 36 inches is standard. With CURTIS cabinets, which are 32 inches in height, this is secured with a 3″ toe strip and 1″ counter top. The working surface height can be changed to meet individual requirements by altering the height of the toe strip.

*Q. How Can Wood Cabinets Be Painted to Conceal the Grain?*

A. This is properly a problem of the painter. A few remarks on the subject, however, may be of assistance to those not so familiar with it.

Many kinds of wood have mixed hard and soft grain. The hard grain is built up during the latter part of summer and the soft grain during the fast growing season in the spring.

When such wood is painted the soft grain tends to soak up the paint, while it builds up on the hard grain as a raised surface. The only remedy is to use a proper type of sealer or undercoat to close the pores of the soft wood before paint or enamel is applied.

Reliable paint manufacturers offer suitable primers and sealers for this particular purpose. Your paint dealer can give you more information and furnish the needed material.

Hand sanding before each coat of paint will help to even up the surface.

# MITERED JOINTS

*Q. Why May a Mitertite Joint Sometimes Appear Out of Square?*

A. A miter joint made perfectly square will not be square if the moisture content of the wood changes after the joint is cut. A 90° miter joint depends upon the meeting of the two 45° angle cuts on two pieces of wood. These cuts represent a diagonal across a board, with one base line across the board and another base line lengthwise of the board. The diagonal is the long side of a right angled triangle which has two equal length legs. Since wood shrinks or swells across the grain and not with the grain it is clear that when the wood changes moisture content, the two legs of our triangle can no longer be the same length and for that reason the diagonal will no longer be at a 45° angle.

If a perfectly cut pair of mitered (90°) wood members take on moisture the angle between them will become greater than 90°, and if the wood shrinks upon drying the angle will become less than 90°. Perfect joints should be cut when the wood is at an average moisture content of what is expected when the job is installed.

*Q. Why Do Mitered Joints Open?*

A. Refer to preceding question and answer. It is there shown that miter cuts in wood will not stay at exactly 45° if the moisture content changes. Now if the two mitered members are nailed to a frame so they must remain at 90° then only one other thing can happen—the joint will open IF IT CAN MAKE ITS JOINT YIELD.

In the CURTIS Mitertite joint the width of stock is purposely kept narrow so that the forces tending to open the joint may be kept at a minimum. Also the construction with a taper insures a tightly drawn joint, and the lock, which extends the full length of the joint, allows the greatest possible length of continuous holding power between the two members. This great joint strength may bend the trim rather than open the joint. A Mitertite joint is an approximation of perfection. Compare Mitertite with imitations.

# PAINT

*Q. How Much Does Paint Stop Shrink or Swell of Wood?*

A. A good paint coating will prevent wood from rapidly absorbing water as a liquid, but it can only delay the eventual entrance of moisture. The moisture of the air will eventually penetrate any of the best paints and varnishes. Well painted wood may require about a month before it absorbs as much moisture as unpainted wood would take up in a few days. The good effect of paint is to stop at the surface, rapid moisture changes. It will stop surface checking and the average moisture content of wood will be less if painted.

Whenever wood takes on more moisture it will swell;

when it dries it will shrink. (This is true for moisture contents up to about 22%). Paint, by retarding moisture change, likewise retards shrink and swell in the same proportion.

*Q. What Is Paint Mildew?*

A. Paint mildew is the troublesome growth of mold which frequently appears on paint that has been subjected to an extreme moist condition. The true mildew growths are limited to the surface of the paint film.

They are frequently common food molds.

*Q. What Is Blue Stain?*

A. Blue stain is somewhat similar to paint mildew, except that the fungi, which are responsible for blue stain, have the ability to penetrate into the wood, discoloring the areas affected. This occurs only in the sapwood; the heartwood is not attacked. Blue stain, as its name implies, is bluish black in color. CURTIS Toxic treatment provides high resistance to blue stain.

*Q. Is "Blue Stain" As Found on Some Windows the Same As the "Sap Stain" Which Occurs in Green Lumber?*

A. No. These infections are caused by entirely different species of fungi. The species causing green lumber infections are never found growing on window sash, unless the wood was improperly kiln-dried. The temperature reached in the dry kiln will kill any fungi which might be present in the wood. CURTIS products are made from wood dried in the most modern kilns.

*Q. How Can I Prevent Mildew or Blue Stain from Growing on My Windows?*

A. Just keep any condensation from forming on the glass and running down on the paint. Storm sash, control of humidifying apparatus, and proper ventilation are required to do this.

*Q. How Can I Remove Mildew or Blue Stain That Has Already Appeared on My Windows?*

A. The earlier the condition is discovered, the easier it will be to control. Usually when mildew or blue stain is first noticed, the paint film and wood are very wet from condensation. Cleaning at this time will effect a temporary removal of surface growth if the moisture condition is to continue. The first step is to stop humidifying the air, ventilate the house, and if considerable cold weather is anticipated, storm sash should be installed. All steps should be taken to dry wood parts as quickly as possible.

1. Instructions for cleaning painted surfaces:

When the wood (and paint) is dry (below 20% moisture content) fungus growth will stop. This is true only as long as condensation is not allowed to re-wet the paint and wood. Re-wetting will start the growth again.

When it is certain that the wood is dry, the surface growth can be removed by using a little full-strength household ammonia on a cloth. In cases where the stain or mildew is discovered early, the ammonia will so clean the surface that repainting will not be necessary.

If it is considered necessary to repaint, only a "treated" or "mildew-proof" paint is recommended if there is any chance that the paint may be wetted again by condensation, even for short periods. CURTIS will supply, upon request, names of manufacturers from whom your dealer can obtain, small quantities of "mildew-proof" paints, enamels, lacquers, or varnishes. We can also supply the name of a tube-packaged product, which can be stirred into any finish to render it mildew resistant.

To prevent recurrence of the growth, whether the windows are repainted or not, keep the windows dry (free from condensation).

2. Instructions for cleaning varnished surfaces.

Varnished surfaces offer an extremely difficult problem especially if the wood is finished in a natural or a light shade, since there is no practical way to remove the discoloration that shows through the varnish. Thoroughly dry the windows, after cleaning as above specified for painted surfaces. The windows may then be refinished with a darker shade of stained varnish. The other alternative is to paint the windows with a base coat and artificially "grain" over it. In either case, treated, or "mildew-proof" materials are recommended if the moisture condition may continue.

*Q. What Is Wrong When Paint Peels Off Woodwork?*

A. Paint loosens from wood, or blisters, when moisture is moving through the wood toward the paint film. The moisture, moving through the cell cavities, compresses the air in the wood ahead of it. The compressed air, in turn, loosens the paint; then the water appears and fills the blister. Frequently, when a blister is opened, it is found to be full of water.

CURTIS has several times verified the fact that there is nothing about our preservative treatment that in any way harmfully affects the adherance of paint film to the wood. In fact the water-repellent in our preservative treatment slows the rate of penetration of moisture enough to greatly minimize the possibilities of paint blisters forming.

*Q. Is CURTIS Preservative Treatment Equal to a Prime Coat of Paint?*

A. That depends entirely upon the kind of prime coat. A mere mixture of thin oil with a bit of coloring may be even less effective than the dip which is applied to CURTIS frames and sash. In actual tests two coats of paint have been applied over CURTIS treated products and the job was equal to a comparative three coat job on material that was not dipped. In general CURTIS does not claim its treatment is the equal of a prime coat.

The oils of the CURTIS treatment give the wood a reasonable measure of surface protection against soaking and grain raising, until full paint protection is provided. Thorough paint jobs and the usual number of paint coats should be applied.

*Q. Does CURTIS Preservative Treatment Interfere with Any Kind of Stain or Finish?*

A. Wood that is rendered water repellent naturally

repels water stains. A water stain of any kind will not generally soak into treated wood.

The CURTIS treatment requires an oil stain but results in a much more uniform appearance since the stain is absorbed more uniformly by the different textures of fibers in the wood.

*Q. Why Should Windows Be Primed Before Hanging? How Should Sash Be Painted for Best Results?*

A. It is desirable to prime sash before hanging because they are apt to be exposed to rain when placed in frame. Silentite sash don't need fitting and can just as well be primed and partly painted while they are where it is easy and convenient to work on them. Even unfitted sash can be primed more conveniently before they are hung. Trimming and fitting will be limited to the edges only. Sash edges, however, must be painted before they are put in place. Be sure to paint tops and bottoms.

We recommend that CURTIS treated sash be primed as it insures a much better job when it is finished.

*Q. Should Top, Sides and Bottom of Windows and Doors Be Painted?*

A. All surfaces should be painted. Tops and bottoms of sash and doors should be painted because those points have the only directly exposed end grain wood. Water will penetrate end grain about 15 times as deep and 15 times as quickly as it will a flat grain surface.

Many cases of wood decay have been traced to water entering unpainted end grain and working its way up in a member painted on all four sides. In such cases moisture enters much more readily than it can get out because the paint resists drying out quickly. An ideal place is thus provided for fungus growth.

*Q. How Can Shutter Joints Be Kept from Opening and How Can Shutters Be Kept from Rotting?*

A. So far no one has found out how to keep wood from changing size when there is a change in its moisture content.

CURTIS shutters have been designed in an effort to minimize the effects of wet and dry conditions to which they must be subjected. The CURTIS dovetailed watershed joint at the cross cleats keeps water out of those joints. Copper flashing along the top edge will very effectively keep water from entering the top end of joints between boards.

Three coats of lead and oil paint is about the best moisture repellent we know of, but even that will not prevent joints from working. The moisture of the air will penetrate any paint yet made. Treatment with CURTIS preservative after assembly and before painting is the best practical decay preventative.

# MISCELLANEOUS DATA

*Q. What Is the Value of Packing Woodwork in Cartons?*

A. In applying this carton packing idea to woodwork we find many advantages—

1. Convenience in handling, storing, etc.

2. Clean, dust free packages insure bright, unsoiled goods to the consumer or "customer."

3. Sealed cartons bring original goods tamper-free to the user.

4. Economy of time saving, in the handling of labeled packages extends all the way from the manufacturer to the builder.

5. Carton packing guarantees delivery of goods in same condition as when packed.

*Q. What Causes Grain of Wood to Raise?*

A. Wood, in its structure, consists of a lot of minute tubular cells commonly called fibers. As long as the walls of these cells can absorb water the wood will swell or increase in size.

In the life of a tree, the rapid growth of the wood during the spring season results in soft, porous fibers whereas the slower growth in the summer produces more dense fibers. This produces alternate layers of soft and hard fibers which have unequal rates of swelling when the wood absorbs moisture. Consequently, when a finished article is exposed to moisture this unequal swelling results in what is commonly known as "raised grain."

The water repellent used in CURTIS preservative treatment tends to keep the moisture out of the wood, thereby minimizing the possibility of grain raising.

Hand sanding with fine paper is the simple remedy when grain raising occurs.

*Q. Are Solid or Plywood Panels Best?*

A. Each is best in its own particular place.

Plywood panels are not suitable for shaping of raised surfaces and solid panels are not suitable for very wide panels.

A good plywood panel is always in order where flat surfaces are wanted. Almost any kind of wood or wood grain is possible in plywood.

In multiple panel doors where panel widths are restricted, solid panels are ideal.

Judgment in selection of the door and the conditions under which it will be used, determine what kind of panel may be best.

*Q. What Causes Door Panels and Flat Surfaces on Mantels and Cabinets to Check or Split?*

A. Every time woodwork splits or checks there is some sort of unseen force acting in a way to tear or pull apart the fibers of the wood. Almost without exception this force is shrinkage, tending to reduce the width of a board that is held rigidly apart at its edges.

Sometimes a piece of board shrinks at its ends while a portion near the center still resists narrowing. The result is end check. Sometimes the surface layer of plywood wants to shrink but the next ply, being end grain, will not permit it. The fibers on the surface layer must then readjust themselves. There is enough elasticity in wood to care for any reasonable, normal change in dimension.

When wood does crack or check, it is certain that abnormal moisture changes are at work. Always investigate the local conditions before blaming the woodwork.

*Q. How Water-Proof Is Glue?*

A. This is a question. Animal or other water soluble glues will hold only until they get wet.

Casein glues, which according to extensive laboratory tests appear absolutely water resistant, may subsequently fail, either because shrink or swell of wood may actually rupture the glue joint when wet, or the glue itself may be attacked by bacteria which may cause it to deteriorate. Some recent treatments have been developed to prevent the latter.

Phenolic resin glue by its very nature should be waterproof. It is immune to bacteria and water does not effect it. The principle drawback to its use in millwork is that the glue must be set in presses with steam heated plates. The thickness and the shapes of much woodwork prevents proper pressure and application of uniform heat. The use of heat also may dry the material in process and cause it to warp. It is used extensively for plywoods, etc.

In many places we have to depend upon the less water resistant types of glue, although continual improvements are being made in glue.

*Q. What Causes Built-up Stair Parts to Separate?*

A. If the furniture in your house never came apart then one might be alarmed about trouble with occasional stair parts. Any kind of woodwork that depends upon glue for its assembly may loosen up under the terrific stresses that are caused by extremes in moisture content. It is not unusual in a house to find that woodwork may have as much as 12% to 14% moisture content in summer and as low as 5% or 6% in the winter with dry artificial heat.

Even mechanically held joints may loosen up and give way under such conditions. The best designs of joint construction and workmanship are used on all CURTIS Woodwork. An honest effort is made to make it as near right as possible.

*Q. Can the Shrink or Swell of Wood Be Calculated?*

A. It can within reason. There are extensive charts and tables available showing the shrink and swell characteristics of wood. From such tables for Ponderosa Pine the following simple easily remembered rule has been devised. Set down three decimal points followed each by two zeros, thus

.00
.00
.00

Then from the top and down write 1, 2, 3 and again from the bottom and up write 1, 2, 3 and we have

.0013 minimum or radial shrink.
.0022 average shrink.
.0031 maximum or tangential shrink.

Radial shrink is in a direction from Bark to center (quarter sawn). Tangential shrink is at 90° from above (Plain sawn).

The above values represent in inches the amount of shrink or swell for 1% of moisture change in a piece of Ponderosa Pine 1″ wide.

Example: Find shrink of a quarter sawn board 8″ wide when moisture content changes from 6% to 12%. Solution: .0013x8x6 = .0624″ = $\frac{1}{16}$″, nearly.

Example: A board of glued up mixed grain Pine 16″ wide increases 4% in moisture content; how much does it swell. Solution: .0022x16x4 = .1408″ = 9/64″, nearly.

*Q. What Service May I Reasonably Expect from Wire Cloth Screens?*

A. Black steel wire screen cloth will rust as soon as it loses its protective coat of paint. The wire should be painted each spring or not later than when rust spots first appear. Many years of service will follow proper care.

Galvanized steel wire cloth is not supposed to be painted. Its years of service are entirely dependent on how good a job of galvanizing has been done by the manufacturer. Several years should be expected. If rust starts, the life can, of course, be prolonged by painting. Manufacturers actually lacquer the screen in addition to plating it.

Copper or bronze wire cloth is generally regarded as being the longest lived. Corrosion is slower than for steel. Such screen is usually given a coat of lacquer by the manufacturer. When copper or bronze is not protected it oxidizes and darkens in color. This oxide may cause discoloration of light colored paint below the screens. To prevent discoloration of paint the screen cloth should be varnished or lacquered regularly. DuPont makes a house paint which is said to be immune to stain from water running off copper screens.

*Q. How Durable Is Cadmium Plating?*

A. Cadmium is a metal which closely resembles zinc, and has been found the best metal coating for general rust-proofing of iron and steel. The principle reason for this lies in the chemical nature of cadmium.

Protection from atmospheric corrosion may be afforded in two ways; (a) by an organic coating, which includes paints, varnishes, enamels, etc., and (b) by a metallic coating such as zinc and cadmium, which not only protects the steel against corrosion in the same sense as paint, but more so by an electro-chemical action too technical to describe here.

Cadmium has the advantage over zinc that it can be used as a base or "under coat" for other metal deposits such as bronze, which is used on the CURTIS casement operator. Cadmium is deposited over steel by the electroplating process and its rust-proofing quality depends largely upon the thickness of the deposit.

The resistance to rust is determined by a test developed by the U. S. Bureau of Standards and generally referred to as "the salt spray test" in which the coated surface is exposed to a spray of salt solution until signs of rust appear. The deposit on the CURTIS Casement unit hardware withstands from one hundred and fifty to two hundred hours of salt spray, which is considered equivalent to from fifteen to twenty years of average outdoor exposure. As none of the CURTIS hardware is directly exposed to the elements, the hardware is protected against rust for an almost indefinite period of time.

*Q. Is Any Weatherstrip Dust-Proof?*

A. Emphatically no. Nothing short of hermetically sealed joints, welded joints, or solid material can be air tight. Any joint such as required by a movable, sliding or hinged sash is not 100% air tight.

Air practically always carries small—very small—particles of dust. The past few years the air over most of the central U. S. has carried a great deal of very small dust particles. Some dust will be carried wherever air can penetrate. But, here is good news, if 95% less air goes through the joints of a window there will be 95% less dust to contend with.

*Q. On a Sash Door Should the Stops Be on the Inside or the Outside?*

A. This question is a perennial one. We have questioned both architects and contractors with almost 50-50 results so that as far as actual practice is concerned, it is probably safe to say that it is entirely a question of personal opinion.

Our own opinion is this: If the door is in a well-protected position, it does not make a particle of difference which is out but if it is not protected by a porch or a recessed entrance, then it is our very definite recommendation that the door be hung with the stops on the outside because in that position, even though the glass is well bedded in putty, there is less tendency for leakage around the glass in a driving rain than if the stops are placed on the inside.

We sometimes hear the argument that the stops should be placed on the inside as a matter of burglar protection. This argument of course is too trite to have any consideration.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# HOW TO HELP YOUR HOME SAY "*Welcome*" INSIDE AND OUT

Starting with the front entrance, the woodwork of a home—both inside and out—expresses the personality of the owner. Woodwork can transform an ordinary, cheerless house into a home that is livable and loveable—one that always says "welcome."

If selected carefully, woodwork will retain its grace and charm indefinitely. Look at the many beautiful homes in this country that are over 100 years old. Their entrances, doors, windows, and interior woodwork have stood the test of time—they have not been affected by woodwork "fads."

Many pieces of the CURTIS Woodwork line were designed by famous architects. Their contribution to the Curtis line is your assurance of architecturally correct woodwork for your home.

It is easy to select stock CURTIS Woodwork for a home. For instance, CURTIS offers a choice of twenty different entrances. You may choose from Early Connecticut, English, Colonial, Regency and Classic, to mention but a few. Cabinets, mantels, doors, trim, shutters, stairways may also be had in a wide variety of styles. CURTIS makes all the woodwork for the home.

THE CURTIS LINE INCLUDES:

Silentite Windows . Exterior and Interior Doors . Frames . Trim . Entrances . Molding . Panel Work . Kitchen Cabinets . Cabinet Work . Mantels . Stairways . Shutters . Screens . Storm Doors and Windows . Garage Doors . Mitertite Door and Window Trim.

CURTIS Woodwork is sold by leading lumber and material dealers everywhere. If you are unable to locate the CURTIS dealer in your vicinity, write us for his name.

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